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ABSTRACT

This paper defines secondary ignorance as "not knowing that one does not know" and goes on to discuss the prevalence of secondary ignorance among school children. It describes a study in which a group of elementary school children were asked to find solutions to problematic situations and to indicate on a five-point scale how certain they were that their answer was correct. Despite a wide variation in answers, each child asserted that he was completely certain that he was correct. A method is outlined whereby teachers can show children how to identify situations in which it is appropriate to be uncertain of the correct answer. This method involves identifying simple situations in which it can be demonstrated that the correct answer is not known but that educated guesses can be made, and rewarding the generation of various response alternatives to given problem situations. Students should then be helped to decide which alternative seems most likely to be correct on the basis of the information they have, and how much certainty is warranted for that alternative. (RT)

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Overcoming Secondary Ignorance: Learning to be Uncertain

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Overcoming Secondary Ignorance: Learning to be Uncertain [1,2]

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One desirable outcome of education is that students become more capable of coping with new and unanticipated problems. Since old solutions may be inappropriate to new problems, curricula are designed to promote insightful and generalizable problem solving skills. However, one ability which is necessary for the development of intellectual power and creative problem solving, but which has received little consideration in modern educational practice, is the ability to generate and handle uncertainty. Uncertainty has two different but related definitions: a.) a feeling of unsureness, and b.) an awareness of two or more solution alternatives, each of which is considered likely but not certain to lead to a desired solution. The number of alternatives under consideration and the degree of unsureness experienced are highly correlated, i.e., the more choice alternatives persons consider, the more uncertainty they tend to experience.[3]

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[1]This is a slightly expanded version of a symposium paper presented at the 19th Annual State Conference on Educational Research, California Teacher's Association, San Diego, November, 1967.

[2]I wish to thank Miss Patricia Engle for her assistance in the research reported herein, and Professor Fannie Shaftel, Mr. David Feldman and Mrs. Ruth Rondberg for their valuable suggestions in connection with this report.

[3]Driscoll, J.M., & Lanzetta, J.T., "Effects of Two Sources of Uncertainty in Decision Making", Psychological Reports, 1965, 17, 635-648.

The Constructiveness of Uncertainty

When dealing with situations that are problematic (i.e., situations in which the answer is not or cannot be known for certain), the well-informed individual is aware of the uncertainty of the situation. When it is necessary for him to make a decision on the basis of incomplete information, he knows that he may be wrong; following a decision, he remains receptive to additional information irrespective of whether it supports his decision, and incorporates that information into his knowledge of the matter. The majority of one's daily decisions are of the kind in which certainty is not warranted. For instance, in order to get along satisfactorily with others one must make judgments about their personality but since one never has complete information about the habits and motives of others, there is no basis for certainty. For example, one may trust another enough to lend him a book, believing on various grounds that the book will probably be returned. Yet, he may realize that there are a variety of reasons why the book may never be returned.

However, many persons fail to recognize when situations are problematic. They fail to generate alternative interpretations of the way in which events may occur, and are (erroneously) certain of the correctness of their ideas; they do not know that they do not know the correct answer.[4,5] Ignorance denotes the state of not knowing. We shall coin the expression "secondary ignorance" to denote the state of not knowing that one does not know.

Some persons consistently exhibit much secondary ignorance.

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[4]Sieber, J.E. & Lanzetta, J.T., "Conflict and Conceptual Structure as Determinants of Decision Making Behavior", Journal of Personality, 1964, 32, 622-641.

[5]Ziller, R.C. & Long, B.H., "Some Correlates of the Don't Know Response in Opinion Questionaires", Journal of Social Psychology, 1965, 67, 139-147.

That is, they rarely indicate that they do not know. On tests of dogmatism, they score quite high. They make decisions rapidly, do not expose themselves to new information, and are not curious.[6] To illustrate, let us consider three classic and familiar examples of school children who are often secondarily ignorant:

1.) "The genius" is usually a socially inept child whose only distinction among his peers is that he knows almost everything. To support his reputation, he is usually the first to blurt out answers, but may be at a loss to explain his reasons. The endless flow of facts which he hostilely barks out to others includes a strange mixture of misunderstood and wrong information. For example, "No Dutch person <u>ever</u> wears leather shoes!" "<u>I</u> understand relativity! $E = mc^2$!"

2.) "The true believer" is usually the member of a whole family of "true believers" whose views, be they social, political, or religious, are emotion-laden and narrow. Information which does not support their view tends to be rejected automatically. For example, "I <u>know</u> evolution doesn't happen because my father said God made all people!"

3.) Most of the rest of the class who accept unquestioningly all that they read and hear, and do not search for alternative interpretations, exceptions to rules, or new solutions to old problems. For example, "I know it's going to rain because the weather man said so." "All of the white people in the North fought in the Civil War to free all of the Negroes from slavery."

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[6] <u>Ibid</u>., 139-147.

The value of being able to generate and handle uncertainty when solving difficult problems has been demonstrated in various experiments. Persons who are able to generate alternative solutions and are willing to admit to being uncertain also tend to seek relatively more information with which to evaluate alternatives, spend more time considering their decisions, and are more often correct in their final decision.[7,8] Moreover, creative persons tend to be persons who can generate relatively more alternative responses.[9] In summary, in problematic situations, effective problem solvers tend to entertain relatively much uncertainty. Persons with "secondary ignorance" are too sure they are right to discover otherwise.

A Study of Children's Level of Uncertainty

In an informal classroom study, it was found that elementary school children in a working class neighborhood arrived at solutions to problematic situations rapidly, incorrectly, and with certainty of their correctness. One classroom each of first, second, fourth, fifth and sixth graders participated in this study. The children were given problems orally. They were instructed to state what they believed to be the answer, and to indicate on a five point scale how certain they were that their answer was correct. They were given a five point certainty scale similar to that shown in Figure 1, and instructed in its use. Some examples of these problems are the following:

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[7]Sieber, J.E. & Lanzetta, J.T., "Some Determinants in Individual Differences in Pre-decision Information Processing Behavior", Journal of Personality and Social Psychology, 1966, 4, 561-571.

[8]Driscoll, J.M., op. cit.

[9]Mednick, S.A., "The Associative Basis of the Creative Process", Psychological Review, 1962, 69, 220-232.

1.) "Turn around and look at the back bulletin board. Now face the front of the room." The word at the top of the bulletin board was than covered up and the children were asked to recall a characteristic of the script used in the bulletin board. For example: "In the word 'Spring' at the top of the bulletin board, is the 'g' written like this: , or like this: ?"

2.) "Suppose someone left the class and when he returned, he told you that the sidewalk outside was wet. Guess why it is wet, and tell how sure you are of your guess."

3.) "Look at the coats hanging in the back of the room. Now look to the front of the room. What color is the coat on the end by the door, (e.g., blue, green or brown?) How sure are you of your guess?"

The results are simple to report. In every case in which a child answered, he also asserted that he was completely certain that he was correct. Many children answered each question. In each case, children were eager to volunteer answers. The answers varied widely from one another, but no child admitted to uncertainty.

Teaching Children When to be Uncertain

Irrespective of whether this tendency to be certain is a normal characteristic of elementary school age children or a result of teachers' proneness to reward confident quick answers, the most important point that can be made is that this behavior can be changed. This change can be brought about through a specific set of experiences which a teacher may provide for children for the purpose of teaching them when to be uncertain. Moreover, there are specific criteria by which the children's progress may be measured to ascertain whether they have met a given level of learning when to be uncertain. This is noteworthy, for throughout the controversy

among educators concerning the merits of specifying educational objectives in behavioral terms, the opponents [10,11] have pointed out that such precision in specifying, producing and measuring behavior is not hard to attain in trivial ways, but is difficult to achieve with respect to higher order intellective processes and in meaningful situations. The protagonists have never answered this objection except by pointing out that unspecified objectives are usually inadequately thought out and <u>also</u> trivial.[12]

Let us state, as a behavioral objective, that we wish to teach children to know when they should be uncertain--when complete certainty is not warranted by the information which they have. Instead of simply resolving to teach children to be open-minded, rather than dogmatic, we will state what steps must be taken in order to arrive at this goal: (1) We need to devise some situations in which children clearly have no basis for certainty, such as the three examples of problematic situations which are given above. (2) Following a procedure such as that used in the study described above, children may be asked to suggest plausible answers and to state how certain they are of these answers. (3) Each child may write down his guess and indicate his level of certainty. Children may make their uncertainty ratings on a five point scale such as the one shown in Figure 1, below.

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[10] Eisner, E.W., "Educational Objectives: Help or Hindrance", <u>School Review</u>, Fall, 1967.

[11] Jackson, P.W. & Belford, Elizabeth, "Educational Objectives and the Joys of Teaching", <u>School Review</u>, 1965, <u>73</u>, 267-291.

[12] Popham, W. James, "Threat-Potential of Precision", paper read at the 19th Annual State Conference on Educational Research, California Teacher's Association, San Diego, November, 1967.

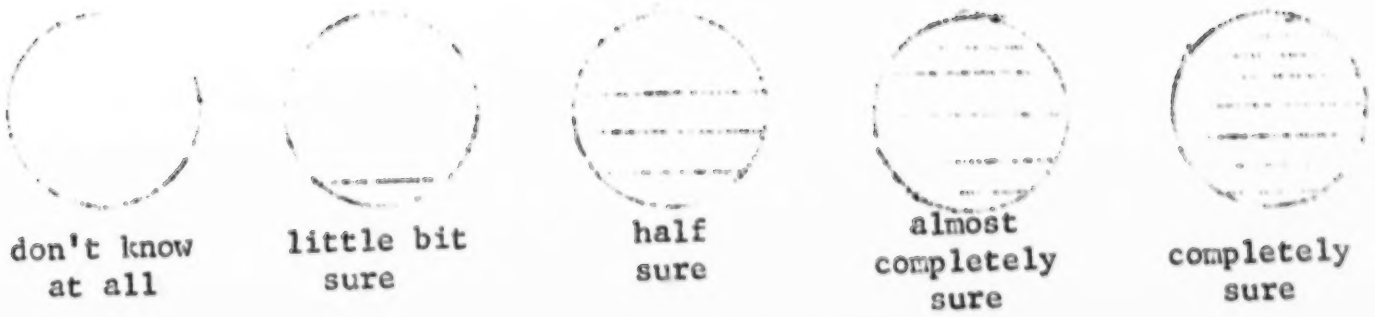

Figure 1. Uncertainty rating scale

It has been found that elementary school children quickly learn how to use such a scale, and to apply it to a variety of problematic tasks.

(4) Each problem should be discussed in detail.

Problems having known, determinate solutions should be interspersed with the indeterminate problems. In the case of the indeterminate problems after the students have indicated their degree of uncertainty on the uncertainty rating scale, the teacher should point out why there is no basis for certainty with the information given, and should encourage students to contribute information which bears on this point. It should be indicated clearly that the object of the task is to estimate uncertainty accurately. Similarly, the basis for partial or complete certainty, when warranted, should be explored in class discussion. Children's uncertainty ratings provide a record of the growth of their ability to discriminate between differing degrees of problem uncertainty.

In some tasks, the teacher may present children with alternative answers: in other tasks, children may be required to generate their own alternatives. For some tasks, some children will have more information than others, and some may actually know the correct answer. Tasks should be chosen, however, so that most children will not know the correct answer, and may be encouraged to indicate their uncertainty and the reasons for it or the alternatives they have generated. Note that discussion and reward are

invariably centered around the reasonableness of childrens' uncertainty estimates, rather than the correctness of an answer. After experimenting with a variety of simple classroom situations, the task of estimating uncertainty may be used in the course of various lessons. For example, in studying the weather, the following problem may be given:

> "One goes outside in the morning and notices that the sidewalk is wet. Why do you think it is wet?" The children should be encouraged to guess why the sidewalk may be wet, and to state how certain they are of the correctness of their guesses. As soon as just a few such suggestions have been given, the teacher should change the criterion for evaluation to that of ability to generate a lot of alternative reasons why the sidewalk may be wet.

In this way it can be demonstrated to children that it is indeed foolish to state that one is certain of one's hypothesis on why the sidewalk is wet when there are so many reasonable hypotheses that can be generated. At the same time it should be pointed out that this does not mean that it is foolish to generate hypotheses; rather, it is only foolish to be certain of hypotheses when reasonable alternative hypotheses exist.

What has been done? First, children have been taught that a highly respectable response in some situations is simply that one does not know, or is not entirely certain. Second, exploration of the sources of one's uncertainty has been encouraged. That is, the consideration of alternative interpretations of situations has been encouraged. This, rather than the quick dogmatic answer, has become the criterion of successful participation in the classroom. Another evaluative criterion could also be imposed on students' performance: the number of problem cues they can discern, that lead to varying solution alternatives. In the above example, this could be done by examining a wet sidewalk to discover evidence which helps to determine whether the sidewalk is wet because of rain, dew, spilt water, a broken water main, or run-off from a nearby bog. The nature of this task is to describe a situation and state what alternative hypotheses the

situation suggests rather than to give an answer. Students may be evaluated quite objectively on the number of relevant situational cues they can identify. Aids and hints may be given at first. It will be observed that students' ability to generate such information increases with practice.

As these examples have indicated, several steps are involved in creating situations which are conducive to increasing uncertainty or reducing secondary ignorance: (1) In any lesson, be it arithmetic, meteorology, biology, social studies, or literature, the teacher needs to identify problematic issues. Such issues may be major ones built into the curriculum, such as identification of the causes of the Civil War, or, (as in the matter of identifying the source of the water on the sidewalk), they may be problems especially devised by the teacher for classroom discussion. (2) Prior to the lesson, the teacher should understand the basis for several alternative hypotheses, which he may then use to help students understand why any rational person <u>should</u> be uncertain about an answer given in such a situation. (3) The problem should be presented and students should be given the <u>explicit</u> goal of generating hypotheses and stating their grounds for certainty or uncertainty. (4) The students should be helped in their hypothesizing, and rewarded for their search for hypotheses and for confirming and disconfirming evidence. The teacher should acknowledge that good hypotheses may be difficult to generate, as they are often not obvious. And certainly, he should not indicate that all reasonable hypotheses have been examined merely because he himself cannot think of any more. He should be genuine and sincere in his acceptance of students' hypotheses. (5) Finally, students should be helped to decide which hypothesis seems most likely to be correct on the basis of the information they have amassed, and how much certainty is warranted for that hypothesis.

Good Side-Effects

Pre-specification of educational objectives in behavioral terms has been rejected by some on grounds that this prevents teachers from taking advantage of instructional opportunities that unexpectedly occur in the classroom. I would like to argue to the contrary. Teachers who have explicitly planned and carried out lessons of this type certaily increase the likelihood of their identifying unexpected instances of dogmatism or secondary ignorance, and of their being able to help students to produce alternative interpretations. Both on a pre-planned basis and spontaneously, I would argue that these behavioral objectives and ways of meeting them can be made an integral part of specific curricula and of teachers' informal behavioral repertories.

To review, a teacher need take three simple steps: (1) Create or identify simple situations in which it can be demonstrated that the correct answer is not known for certain but that educated guesses can be made, and that it is appropriate to be unsure about the correctness of such guesses. (2) Reward the generation of various response alternatives to given problem situations. (3) Reward the discrimination of problem cues which lead to opposing solution alternatives. A not unlikely side-effect of such teaching is that the teacher, himself, may learn a bit more about when to be uncertain.